Thinking person's guide to hedging

Locking in a price without careful thought can be dangerous. ***Cynthia Kase*** *looks at ways of judging when the moment is right.*

THE BASIC RISK management strategy of locking in a price can in some cases be a risk-increasing ploy that puts a hedger at a competitive disadvantage and generates losses rather than profits. It's important for the survival of many firms that they lock into prices at levels that have a high probability of reducing risk. They must avoid fixing prices at levels that put them at a disadvantage.

A small natural gas producer with an accurate estimate of production costs can lock in a profit by selling gas forward at a fixed price that guarantees an acceptable rate of return. A state-owned oil refiner looking to ensure refining margins are adequate to fund its treasury might also follow such a strategy.

But an airline that locks in jet fuel costs in a falling oil market and then finds itself in a fare-cutting war could be at a major disadvantage if the locked-in price is substantially higher than the jet fuel prices paid by competitor airlines.

Similarly, a power company that fixes gas costs by forward purchases that turn out to be well above the average spot price might find it loses industrial clients to independent marketers. The utility might also find that an industry regulator doesn't allow the costs to be included in rates.

Conversely, these same companies may find themselves at a competitive disadvantage if they fail to lock in prices when they are attractive and the opposition does so.

A previous *Energy Risk* article (see *Sailing with the wind*, Vol 1, No 6, July 1994) looked at improving hedges by using short-term dynamic risk-management techniques that allow hedgers to lift and reset hedges at discretion. Long-term passive hedges that will be left until expiration need a different methodology to insure the odds of reducing risk are reasonable.

How do most market participants choose the prices at which they will hedge? Certainly those hedgers who want either to lock in a budget or insure cash flow can simply choose a price that accomplishes their goal. Others simply guess a price and hope for the best or make an educated guess based on market fundamentals or the forecasts of analysts.

There are two major problems with this approach. First, if one believes commodity prices in cyclical and seasonal markets like the energy sector are mean reverting, then purchases above, or sales below, the mean market price will not be competitive in the long run.

As a simple example, let's look at a weekly chart of the New York Mercantile Exchange (Nymex) nearby natural gas contract from 1990 (figure 1). The thick black line shows a mean price of around $1.83 per 10,000 million Btu. A consumer fixing prices by buying futures above the mean at, say, $2.00 would find 15 weeks is the longest single period such a hedge has been competitive compared with the "unhedged" case.

Thus it's important when hedging at a fixed price from which one will "walk-away" to ensure there's a sufficiently high probability the hedge will actually provide a benefit compared with doing nothing at all.

Let's look at some of the criteria we can use in making such a decision. Take the case of a natural gas producer who must compete for capital by showing good returns and building stockholder equity.

The producer is watching Nymex natural gas strip prices for six-, nine-and 12-months forward to judge whether to hedge against a decline in natural gas prices by selling gas futures. Strip prices are averages of Nymex contract prices. We will focus on the nine-month strip and assume we are looking at the market on the first trading day of April 1994.

First, we shall assume that fundamentals indicate a market in balance but with negative, bearish overtones that would prompt the gas producer to sell futures to hedge against a fall in prices. In arriving at this view we would have looked at such factors as transportation throughput and rates, deliverability and other supply-related factors of various reserve basins.

We would also have studied economic factors, including inflation and interest rates and the current and projected status of industry storage levels. Account would also be taken of any special factors affecting our specific business such as the form of contract buyers prefer for example, and whether they want fixed or floating supplies of gas.

Second, we make a statistical analysis of the historical strip price. The Nymex natural gas contract has traded for only a little over four years, but the statistics on the nine-month strip (see figure 2) show the risk manager where the strip has traded in the past and what might be a safe level at which to hedge in the future.

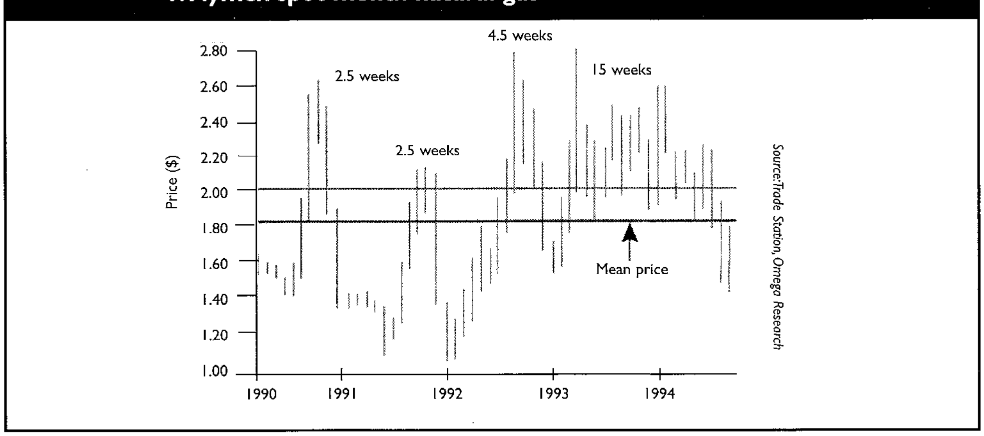
The nine-month strip, assuming an approximately normal distribution, has traded only about 15% of the past four years at a level greater than one standard deviation (equivalent to a price of $2.13) from the $1.84 mean price. Looking at the price at about 1.65 standard deviations from the mean, we can see that over the last four years prices have traded above this level, namely $2.32, for only 5 % of the time.

So at this point we might decide that we shall never lock-in long term hedges below $1.85 because there's a better than even chance over the long term prices will move up from those levels and as a producer we would miss out on a beneficial rise in gas prices.

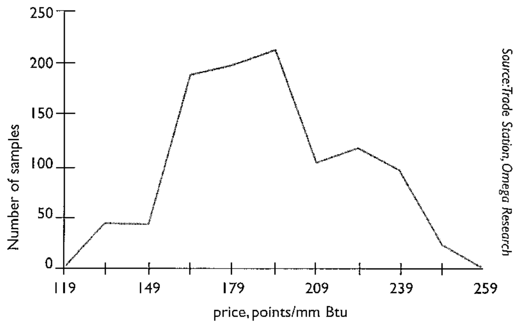
We would only lock in at this level if the market had been depressed for some time and we expected low prices to continue. Under normal circumstance, we might set one standard deviation over the mean, or $2.13, as our minimum hedge level.

A third element in our analysis is a look at the mean price for the strip in the particular season in which we are thinking of placing the hedge. In the period April to May, the

1. Nymex spot month natural gas



2. Price distribution, nine-month Nymex gas strip price, April 1990-1994



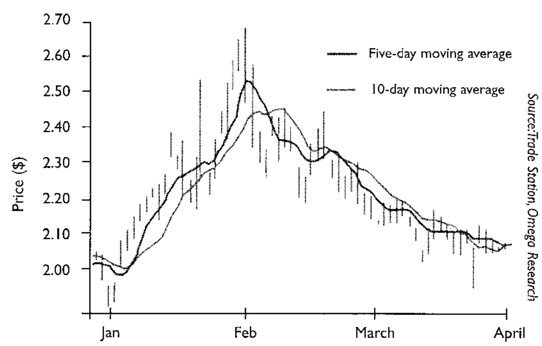
(Historic mean price: $1.84 per 10,000 million Btu; 1 standard deviation: $0.29)

% probability of higher prices	Standard deviations over the mean price	Equivalent nine-month strip price
15	1.033	$2.14
10	1.282	$2.21
5	1.645	$2.32
2.5	1.960	$2.41
2	2.054	$2.44

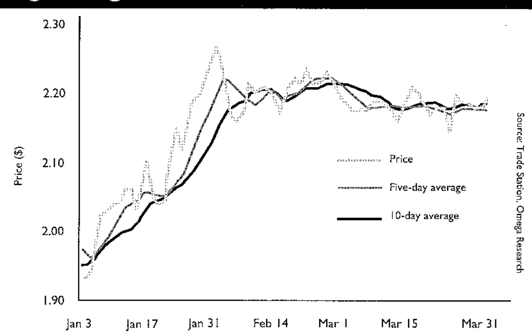
Nymex natural gas nine-month strip price data ($ per 10,000 million Btu) from April 1990-1194

Months in the strip	9	Historic mean	$1.84
Historic standard deviation	$0.29	Mean less one-standard deviation	$1.55
Mean plus one-standard deviation	$2.13	Maximum value	$1.19
Minimum value	$2.55	Median	$1.83
Skew	$0.17	Annual mean standard deviation	$0.19

3. First nearby natural gas contract with moving averages



4. Nine-month forward strip, natural gas with moving averages



mean price is $1.86 and the standard deviation $0.30 for a 15% probability of higher prices at $2.16.

A fourth important set of factors is whether the market is trending and, if so, in what direction and with what level of volatility.

The chart of the first nearby natural gas contract (see figure 3), using simple five- and 10-day moving averages, shows the market in a downtrend since early February with the five-day moving average holding below the 10-day for most of the time.

In early April, the five-day average crosses above the 10-day average after the market has traded in a sideways pattern for about three weeks.

Looking at the nine-month forward strip trend with five- and 10-day simple moving averages shows the market peaked in February and has since oscillated in a sideways manner with a slight downward bias (figure 4). The current price is above both the five-day and 10-day moving averages, but the five-day is only marginally higher than the 10-day average.

These weak technical factors indicate a relatively unsupported market and we form the view that the current upmove probably won't last and that prices will then head lower.

We see that the current price of $2.19 is above both the overall historical one standard deviation price of $2.13 and the seasonal one standard deviation value of $2.17. Thus at this point, we could hedge a portion of our exposure, perhaps 50%, by selling futures.

Over the previous month, nine-month strip volatility measured by standard deviation has run at 10%. One-month volatility is 2.89%, found by dividing 10% by the square root of 12.

Thus the one-standard deviation price we could see if prices continue up in the short-term is $2.26 ($2.19 plus 2.89%). But because prices are not in an overall uptrend, we decide not to wait for a full one standard deviation move to hedge additional gas. Instead we decide to hedge if the price moves up by a one-half standard deviation or to $2.22.

On April 25, the market trades to $2.24, and we trigger our hedge.

Cynthia Kase is a member of the International Association of Financial Engineers, and president of Kase & Company Inc, a New York-based risk management advisory firm